CLAIMS

1. DNA repair induced lethality molecules (DRIL molecules) comprising a sequence-independent backbone of at least 4-10000 base pairs (bp), particularly 4-1000 bp, which are substrates for proteins involved in the NHEJ pathway (sequence - independent pathway), particularly Ku proteins, and DSB damage signalling pathway.

2. Molecules according to claim 1, having a native phosphodiester backbone or a chemically modified phosphodiester backbone, or another backbone with one or several chemical groups, provided that the modified molecules remain substrates for proteins involved in the sequence-independent NHEJ pathway.

3. Molecules according to claim 1 or 2, further comprising sugar mimetics such as 2'-O-alkylribose, 2'-O-alkyl-C4' branched ribose, cyclobutyls or other carbocyclics or hexitol in place of the pentofuranosyl group,

4. Molecules according to anyone of claims 1 to 3, having a linear backbone or made of hairpin double-stranded nucleic acids with a loop comprising nucleic acids or chemical groups such as a hexaethyleneglycol or tetradeoxythymidylate group.

5. Molecules according to anyone of claims 1 to 4, having at least one free end.

6. Molecules according to any one of claims 1 to 4, comprising one or several chemical groups at the end of each strand or, at least, at the 3' end strand.

7. Molecules according to claim 6, comprising one several phosphorothioates at the end of each strand or, at least, at the 3' end strand.

8. Molecules according to anyone of claims 1 to 7, wherein said backbone comprise methylphosphonates, phosphoramidates, morpholino nucleic acid, 2'-O,4'-C methylene/ethylene bridged locked nucleic acid, peptide nucleic acid (PNA), and short

chain alkyl, or cycloalkyl intersugar linkages or short chain heteroatomic or heterocyclic intrasugar linkages of variable length.

9. Molecules according to any one of the preceding claims, wherein the fragments are based on natural nucleotides, either 2'-deoxynucleotides or 2'-ribonucleotides, and optionally comprise one or several modified nucleotides and/or nucleobases other than adenine, cytosine, guanine, thymine and uracil.

10. Molecules according to claim 9, wherein said nucleobases are selected in the group comprising C5-methylcytosine, uracile, pseudoisocytosine, C5-propynyluracil, N7-deazaguanine, N7-glycosylated guanine, or alpha anomer, or other modified nucleobases or a basic residue.

11. Molecules according to any one of the preceding claims, further comprising at least one embedded element, which hampers DNA replication, DNA repair, or damage signalling process, said element(s) being incorporated in the center or at the end of the double-stranded molecules.

12. Molecules according to claim 11, comprising

- a) a polyethyleneglycol chain, preferably a hexaethyleneglycol chain, or any hydrocarbon chain, eventually interrupted and/or substituted by one or more heteroatoms e.g. oxygen, sulfur, nitrogen, or heteroatomic or heterocyclic groups, comprising one or several heteroatoms;
- b) a unit which is a blocking element as it is not amenable by DNA polymerases or exonucleases, such as any 3'-modified nucleotides,
- c) a native oligonucleotide, such as T_n, when used in the loop of an hairpin fragment, preferably a tetradeoxythymidylate (T4).

13. Adjuvant compositions to be used in association with a DNA breaking treatment, particularly radiotherapy or chemotherapy, said compositions comprising at least one DNA

repair induced lethality molecule such as defined in any one of claims 1 to 12, in combination with a pharmaceutically acceptable carrier, in an efficient amount to be introduced in the nucleus of tumor cells.

14. Adjuvant compositions according to claim 13, wherein said DNA repair induced lethality molecules are administrated by any appropriate route, with any acceptable carrier, such as oral, or intravenous, or intratumoral administration, or sub-cutaneous injections.

15. The use in association with a DNA breaking treatment, particularly radiotherapy or chemotherapy, of native double-stranded nucleic acid fragments for making antitumoral drugs for treating tumors, particularly highly resistant tumors to radio-and/or chemotherapies.